



1/16

SEQUENCE LISTING

<110> James M. Hogle  
Harmon J. Zuccola  
David Filman  
Carl Elkin

<120> Oligomerization of Hepatitis Delta  
Antigen

<130> 0725.1056-001

<140> 09/347,175

<141> 1999-07-01

<150> 60/091,609

<151> 1998-07-02

<160> 35

<170> FastSEQ for Windows Version 4.0

<210> 1

<211> 49

<212> PRT

<213> Hepatitis Delta Virus

<400> 1

Gly Arg Glu Asp Ile Leu Glu Gln Trp Val Ser Gly Arg Lys Lys Leu  
1 5 10 15  
Glu Glu Leu Glu Arg Asp Leu Arg Lys Leu Lys Lys Lys Ile Lys Lys  
20 25 30  
Leu Glu Glu Asp Asn Pro Trp Leu Gly Asn Ile Lys Gly Ile Ile Gly  
35 40 45  
Lys

<210> 2

<211> 49

<212> PRT

<213> Hepatitis Delta Virus

<400> 2

Gly Arg Glu Glu Val Leu Glu Gln Trp Val Asn Ser Arg Lys Lys Ala  
1 5 10 15  
Glu Glu Leu Glu Arg Asp Leu Arg Lys Thr Lys Lys Lys Ile Lys Lys  
20 25 30  
Leu Glu Asp Asp Asn Pro Trp Leu Gly Asn Ile Lys Gly Ile Leu Gly  
35 40 45  
Lys

<210> 3  
 <211> 49  
 <212> PRT  
 <213> Hepatitis Delta Virus

<400> 3  
 Gly Arg Glu Glu Val Leu Glu Gln Trp Val Ser Gly Arg Lys Lys Leu  
 1 5 10 15  
 Glu Glu Leu Glu Arg Asp Leu Arg Lys Val Lys Lys Lys Ile Lys Lys  
 20 25 30  
 Leu Glu Asp Glu His Pro Trp Leu Gly Asn Ile Lys Gly Ile Leu Gly  
 35 40 45  
 Lys

<210> 4  
 <211> 49  
 <212> PRT  
 <213> Hepatitis Delta Virus

<400> 4  
 Gly Arg Glu Glu Val Leu Glu Gln Trp Val Ala Gly Arg Arg Lys Gln  
 1 5 10 15  
 Glu Glu Leu Glu Arg Asp Leu Arg Lys Thr Lys Lys Lys Ile Lys Lys  
 20 25 30  
 Leu Glu Glu Glu Asn Pro Trp Leu Gly Asn Ile Lys Gly Ile Leu Gly  
 35 40 45  
 Lys

<210> 5  
 <211> 48  
 <212> PRT  
 <213> Hepatitis Delta Virus

<400> 5  
 Thr Arg Glu Glu Thr Leu Glu Lys Trp Ile Thr Ala Arg Lys Lys Ala  
 1 5 10 15  
 Glu Glu Leu Glu Lys Asp Leu Arg Lys Thr Arg Lys Thr Ile Lys Lys  
 20 25 30  
 Leu Glu Glu Glu Asn Pro Trp Leu Gly Asn Ile Val Gly Ile Ile Arg  
 35 40 45

<210> 6  
 <211> 48  
 <212> PRT  
 <213> Hepatitis Delta Virus

<400> 6  
 Thr Arg Glu Glu Thr Leu Glu Lys Trp Ile Thr Ala Arg Lys Lys Ala  
 1 5 10 15  
 Glu Glu Leu Glu Lys Asp Leu Arg Lys Ala Arg Lys Thr Ile Lys Lys  
 20 25 30  
 Leu Glu Glu Glu Asn Pro Trp Leu Gly Asn Ile Leu Gly Ile Ile Arg  
 35 40 45

<210> 7  
 <211> 49  
 <212> PRT  
 <213> Hepatitis Delta Virus

<400> 7  
 Gly Arg Glu Gln Ile Leu Glu Gln Trp Val Asp Gly Arg Lys Lys Leu  
 1 5 10 15  
 Glu Glu Leu Glu Arg Asp Leu Arg Lys Ile Lys Lys Lys Ile Lys Lys  
 20 25 30  
 Leu Glu Glu Glu Asn Pro Trp Leu Gly Asn Val Lys Gly Ile Leu Gly  
 35 40 45  
 Lys

<210> 8  
 <211> 49  
 <212> PRT  
 <213> Hepatitis Delta Virus

<400> 8  
 Gly Arg Glu Glu Ile Leu Glu Gln Trp Val Ala Gly Arg Lys Lys Leu  
 1 5 10 15  
 Glu Glu Leu Glu Arg Asp Leu Arg Lys Thr Lys Lys Lys Leu Lys Lys  
 20 25 30  
 Ile Glu Asp Glu Asn Pro Trp Leu Gly Asn Ile Lys Gly Ile Leu Gly  
 35 40 45  
 Lys

<210> 9  
 <211> 37  
 <212> PRT  
 <213> Artificial Sequence

<220>  
 <223> Residues 12-48 of delta 12-60 (Y)

<400> 9  
 Gly Arg Glu Asp Ile Leu Glu Gln Trp Val Ser Gly Arg Lys Lys Leu  
 1 5 10 15  
 Glu Glu Leu Glu Arg Asp Leu Arg Lys Leu Lys Lys Lys Ile Lys Lys  
 20 25 30  
 Leu Glu Glu Asp Asn  
 35

<210> 10  
 <211> 604  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Synthetic Gene for Optimized Expression of HDAG-S  
 in E. Coli

&lt;221&gt; CDS

&lt;222&gt; (7)...(591)

&lt;400&gt; 10

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gggcat atg agc cgt agc gaa cgt cgt aaa gat cgt ggc ggc cgt gaa      48
      Met Ser Arg Ser Glu Arg Arg Lys Asp Arg Gly Gly Arg Glu
        1              5              10

gat att ctg gaa cag tgg gtg agc ggc cgt aag aag tta gag gaa ttg      96
Asp Ile Leu Glu Gln Trp Val Ser Gly Arg Lys Lys Leu Glu Glu Leu
  15              20              25              30

gaa cgt gat ctg cgt aaa ctg aaa aag aag att aag aaa ctg gaa gaa      144
Glu Arg Asp Leu Arg Lys Leu Lys Lys Lys Ile Lys Lys Leu Glu Glu
              35              40              45

gat aac ccg tgg ttg ggt aat att aaa ggc att att ggc aag aaa gat      192
Asp Asn Pro Trp Leu Gly Asn Ile Lys Gly Ile Ile Gly Lys Lys Asp
              50              55              60

aaa gat ggc gaa ggc gcg ccg ccg gcg aag aaa ctg cgt atg gat cag      240
Lys Asp Gly Glu Gly Ala Pro Pro Ala Lys Lys Leu Arg Met Asp Gln
              65              70              75

atg gaa att gat gcg ggc ccg cgt aaa cgt ccg ctg cgt ggc ggc ttt      288
Met Glu Ile Asp Ala Gly Pro Arg Lys Arg Pro Leu Arg Gly Gly Phe
      80              85              90

acc gat aag gaa cgt cag gac cat cgt cgt cgt aaa gcg ctg gaa aac      336
Thr Asp Lys Glu Arg Gln Asp His Arg Arg Arg Lys Ala Leu Glu Asn
      95              100              105              110

aaa cgt aaa cag ctg agc agc ggc ggc aaa tct ctg agc cgt gaa gaa      384
Lys Arg Lys Gln Leu Ser Ser Gly Gly Lys Ser Leu Ser Arg Glu Glu
              115              120              125

gaa gaa gaa ctg aaa cgt ctg acc gaa gaa gat gaa aaa cgt gaa cgt      432
Glu Glu Glu Leu Lys Arg Leu Thr Glu Glu Asp Glu Lys Arg Glu Arg
              130              135              140

cgt att gca ggt cca tct gtt ggt ggt gtg aac ccg ctg gaa ggc ggc      480
Arg Ile Ala Gly Pro Ser Val Gly Gly Val Asn Pro Leu Glu Gly Gly
      145              150              155

agc cgt ggt gca ccg ggc ggt ggc ttt gtg ccg tct atg caa ggt gtt      528
Ser Arg Gly Ala Pro Gly Gly Gly Phe Val Pro Ser Met Gln Gly Val
      160              165              170

cca gaa agc ccg ttt gcg cgt acc ggc gaa ggc ctg gat att cgt ggc      576
Pro Glu Ser Pro Phe Ala Arg Thr Gly Glu Gly Leu Asp Ile Arg Gly
      175              180              185              190

agc cag ggc ttt ccg taaacctgg cgc      604
Ser Gln Gly Phe Pro
              195

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&lt;210&gt; 11

&lt;211&gt; 195

&lt;212&gt; PRT

&lt;213&gt; Artificial Sequence

&lt;220&gt;

<223> Amino acid sequence encoded by synthetic Gene for  
Optimized Expression of HDAG-S in E. Coli

&lt;400&gt; 11

```

Met Ser Arg Ser Glu Arg Arg Lys Asp Arg Gly Gly Arg Glu Asp Ile
 1           5           10           15
Leu Glu Gln Trp Val Ser Gly Arg Lys Lys Leu Glu Glu Leu Glu Arg
      20           25           30
Asp Leu Arg Lys Leu Lys Lys Lys Ile Lys Lys Leu Glu Glu Asp Asn
      35           40           45
Pro Trp Leu Gly Asn Ile Lys Gly Ile Ile Gly Lys Lys Asp Lys Asp
      50           55           60
Gly Glu Gly Ala Pro Pro Ala Lys Lys Leu Arg Met Asp Gln Met Glu
      65           70           75           80
Ile Asp Ala Gly Pro Arg Lys Arg Pro Leu Arg Gly Gly Phe Thr Asp
      85           90           95
Lys Glu Arg Gln Asp His Arg Arg Arg Lys Ala Leu Glu Asn Lys Arg
      100          105          110
Lys Gln Leu Ser Ser Gly Gly Lys Ser Leu Ser Arg Glu Glu Glu Glu
      115          120          125
Glu Leu Lys Arg Leu Thr Glu Glu Asp Glu Lys Arg Glu Arg Arg Ile
      130          135          140
Ala Gly Pro Ser Val Gly Gly Val Asn Pro Leu Glu Gly Gly Ser Arg
      145          150          155          160
Gly Ala Pro Gly Gly Gly Phe Val Pro Ser Met Gln Gly Val Pro Glu
      165          170          175
Ser Pro Phe Ala Arg Thr Gly Glu Gly Leu Asp Ile Arg Gly Ser Gln
      180          185          190
Gly Phe Pro
      195

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&lt;210&gt; 12

&lt;211&gt; 1679

&lt;212&gt; DNA

&lt;213&gt; Hepatitis Delta Virus

&lt;400&gt; 12

```

cttgagccaa gttccgagcg aggagacgcg gggggaggat cagctcccga gaggggatgt 60
cacggtaaaag agcattggaa cgtcggagaa actactccca agaagcaaag agaggtctca 120
ggaagcggac gagatcccca caacgccgga gaatctcttg aaggggaaag aggaaggtgg 180
aagaaaaagg ggcgggcctc ccgatccgag gggcccaacc tccagatctg gagagcactc 240
cggcccgaag ggttgagtag caccagagag gaggaatcca ctcgagatg agcagagaaa 300
tcacctccag aggaccctt cagcgaacaa gagcgcttc gagcggtagg agtaagacca 360
tagcgatagg aggagatgct aggagtaggg ggagaccgaa gcgaggagga aagtaaagaa 420
agcaacgggg ctagccggtg ggtgttccgc ccccgagag gggacgagtg aggcttatcc 480
cggggaattc gacttatcgt ccccatctag cgggaccccg gaccccttc gaaagtgacc 540
ggagggggtg ctgggaacac cggggaccag tggagccatg ggatgccct cccgatgctc 600
gactccgact ccccccccca aggttcgccc aggaatggcg ggacccact ctgcagggtc 660
cgcgttccat cctttcttac ctgatggccg gcatggctcc agcctcctcg ctggcgcccg 720
ctgggcaaca ttccgagggg accgtccctt cggtaatggc gaatgggacc cacaaatctc 780
tctagattcc gatagagaat cgagagaaaa gtggctctcc cttagccatc cgagtggacg 840
tgcgtcctcc ttcggatgcc caggtcggac cgcgaggagg tggagatgcc atgccgacct 900
gaagaggaaa gaaggacgcg agacgcaaac ctgtgagtgg aaaccgcgtt tattcactgg 960
ggtcgacaac tctggggaga aaagggcgga tcggctggga agagtatatc ccatggaat 1020

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ccctgggtttc ccctgatgtc cagccccctcc ccggtccgag agaaggggga ctccgggact 1080
ccctgcagac tggggacgaa gccgcccccg ggcgtccccc tcgatccacc ttcgaggggg 1140
ttcacacccc caaccggcgg gccggctact cttctttccc ttctctcgtc ttccctcggc 1200
aacctcctga gttcctcttc ttctccttg ctgaggttct tgccctccgc cgatagctgc 1260
ttcttcttgt tctcgagggc cttccttcgt cggtgatcct gcctctcctt gtcgggtaat 1320
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tctctctcga gttcctctaa cttctttctt ccggccaccc actgctcgag gatctcttct 1560
ctccccccgc ggttcttctt cgactcggac cggctcatct cggctagagg cggcagtcct 1620
cagtactctt actcttttct gtaaagagga gactgctgga ctgcgccccc gagccccgag 1679

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&lt;210&gt; 13

&lt;211&gt; 1683

&lt;212&gt; DNA

&lt;213&gt; Hepatitis Delta Virus

&lt;400&gt; 13

```

atgggccaaag ttccgaacaa ggatccgcgg ggaggacgga tcacctcccg agaggggtaa 60
gtcgctaaaag agcattggaa cgtcggagat acaactccca agaagaaaaa aagagaaagc 120
aagaagcggga agaattcccc ataacgctag tgaaactcta ggaagggaaa agaggtgcga 180
tgaaaaaaga ggaggtgggc ctcccgatcc gaggggtccc gtggccaagt ttggaggaca 240
ctccggcccc aaggggttgag gatccccag agggaggaag ccacacggag tagaacagag 300
aatcacctc cagaggaccc cttcagcgaa cagaggggcg catcgcgaga gggagtagac 360
catagcgatg ggaggggatg ctaggagtta ggggagaccg aagcgaggag gaaagtaaag 420
agagcagcgg ggctagtcgg tgggtgttcc gccccccgag aggggacgag tgaggcttat 480
cccgggggaat tcgactttat gtccccacat agcagagccc cggacccccct ttcaaagcga 540
ccgagggggg tgactttgaa cattggggac cagtggagcc atgggatgct cctcccgatt 600
ccgccccaaac tccttccccc ccaagggtcg ccaggaatg gcgggacccc actctgcagg 660
gtccgcgttc catcctttct tacctgatgg ccggcatggt ccagcctcc tcgtggcgc 720
cggtcgggca acattccgag gggaccgtcc cctcgtaaat ggcgaatggg acgcacaaat 780
ctctctagct tcccagagag aagcgagaga aaagtggctc tcccttggcc atccgagtgg 840
acgtacgtcc tccttcggat gccaggtcg gaccgcgagg aggtggagat gccatgccga 900
cccgaagagg aaagaaggac gcgagacgca aacctgtgag tggaaacccg ctttattcac 960
tggggtcgac aactctgggg agagaaggga gggtcggctg ggaagagtat atcccatggg 1020
aatccctggc ttccccctat gtccagtcct tccccggctc gagcgaaggg ggactccggg 1080
actccttgca tgctggggac gaagccgccc ccgggcgctc ccctcgatcc accttcgagg 1140
gggttcacac cccaaccga cgggcgggct attcttcttt cccttttctc gtcttctctg 1200
gtcaacctct taagtctctc ttctctctcc ctgctgaggc tctttccccc cgacgatagc 1260
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aatcctcccc tgagaggcct cttcctaggt ccggcgtcta tctccatctg gtccatccgg 1380
agctttcttc cgggggtgct cccctctcca tccttatcct tctttccgat tattcctttg 1440
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aggtctctct cgagttcctc taacttcttt cttccgctca cccactgctc gaggatgtct 1560
tccctccccc cgcggtcttt ctttctttct gaccggctca tcttcgacta gaggcgacgg 1620
tcctcagtac tcttactctt ttctgtaaag aggagactgc tggccctgtc gcccaagctc 1680
gag 1683

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&lt;210&gt; 14

&lt;211&gt; 645

&lt;212&gt; DNA

&lt;213&gt; Hepatitis Delta Virus

&lt;220&gt;

&lt;221&gt; CDS

&lt;222&gt; (1)... (642)

<400> 14

atg agc cgg tcc gaa aga agg aaa gac cgc ggg ggg agg gaa gac atc	48
Met Ser Arg Ser Glu Arg Arg Lys Asp Arg Gly Gly Arg Glu Asp Ile	
1 5 10 15	
ctc gag cag tgg gtg agc gga aga aag aag tta gag gaa ctc gag aga	96
Leu Glu Gln Trp Val Ser Gly Arg Lys Lys Leu Glu Glu Leu Glu Arg	
20 25 30	
gac ctc cgg aag tta aag aag aaa atc aag aaa cta gag gaa gac aat	144
Asp Leu Arg Lys Leu Lys Lys Lys Ile Lys Lys Leu Glu Glu Asp Asn	
35 40 45	
ccc tgg ctg gga aac atc aaa gga ata atc gga aag aag gat aag gat	192
Pro Trp Leu Gly Asn Ile Lys Gly Ile Ile Gly Lys Lys Asp Lys Asp	
50 55 60	
gga gag ggg gca ccc ccg gcg aag aag ctc cgg atg gac cag atg gag	240
Gly Glu Gly Ala Pro Pro Ala Lys Lys Leu Arg Met Asp Gln Met Glu	
65 70 75 80	
ata gac gcc gga cct agg aag agg cct ctc agg gga gga ttc acc gac	288
Ile Asp Ala Gly Pro Arg Lys Arg Pro Leu Arg Gly Gly Phe Thr Asp	
85 90 95	
aag gag agg cag gat cac cga cga agg aag gcc ctc gag aac aag agg	336
Lys Glu Arg Gln Asp His Arg Arg Arg Lys Ala Leu Glu Asn Lys Arg	
100 105 110	
aag cag cta tgc tgc ggg gga aag agc ctc agc agg gag gag gaa gag	384
Lys Gln Leu Ser Ser Gly Gly Lys Ser Leu Ser Arg Glu Glu Glu Glu	
115 120 125	
gaa ctt aag agg ttg acc gag gaa gac gag aaa agg gaa aga aga ata	432
Glu Leu Lys Arg Leu Thr Glu Glu Asp Glu Lys Arg Glu Arg Arg Ile	
130 135 140	
gcc ggc ccg tgc gtt ggg ggt gtg aac ccc ctc gaa ggt gga tgc agg	480
Ala Gly Pro Ser Val Gly Gly Val Asn Pro Leu Glu Gly Gly Ser Arg	
145 150 155 160	
gga gcg ccc ggg ggc ggc ttc gtc ccc agc atg caa gga gtc ccg gag	528
Gly Ala Pro Gly Gly Gly Phe Val Pro Ser Met Gln Gly Val Pro Glu	
165 170 175	
tcc ccc ttc gct cgg acc ggg gag gga ctg gac ata agg gga agc cag	576
Ser Pro Phe Ala Arg Thr Gly Glu Gly Leu Asp Ile Arg Gly Ser Gln	
180 185 190	
gga ttc cca tgg gat ata ctc ttc cca gcc gac cct ccc ttc tct ccc	624
Gly Phe Pro Trp Asp Ile Leu Phe Pro Ala Asp Pro Pro Phe Ser Pro	
195 200 205	
cag agt tgt cga ccc cag tga	645
Gln Ser Cys Arg Pro Gln	
210	

<210> 15  
 <211> 214  
 <212> PRT  
 <213> Hepatitis Delta Virus

<400> 15  
 Met Ser Arg Ser Glu Arg Arg Lys Asp Arg Gly Gly Arg Glu Asp Ile  
 1 5 10 15  
 Leu Glu Gln Trp Val Ser Gly Arg Lys Lys Leu Glu Glu Leu Glu Arg  
 20 25 30  
 Asp Leu Arg Lys Leu Lys Lys Lys Ile Lys Lys Leu Glu Glu Asp Asn  
 35 40 45  
 Pro Trp Leu Gly Asn Ile Lys Gly Ile Ile Gly Lys Lys Asp Lys Asp  
 50 55 60  
 Gly Glu Gly Ala Pro Pro Ala Lys Lys Leu Arg Met Asp Gln Met Glu  
 65 70 75 80  
 Ile Asp Ala Gly Pro Arg Lys Arg Pro Leu Arg Gly Gly Phe Thr Asp  
 85 90 95  
 Lys Glu Arg Gln Asp His Arg Arg Arg Lys Ala Leu Glu Asn Lys Arg  
 100 105 110  
 Lys Gln Leu Ser Ser Gly Gly Lys Ser Leu Ser Arg Glu Glu Glu Glu  
 115 120 125  
 Glu Leu Lys Arg Leu Thr Glu Glu Asp Glu Lys Arg Glu Arg Arg Ile  
 130 135 140  
 Ala Gly Pro Ser Val Gly Gly Val Asn Pro Leu Glu Gly Gly Ser Arg  
 145 150 155 160  
 Gly Ala Pro Gly Gly Gly Phe Val Pro Ser Met Gln Gly Val Pro Glu  
 165 170 175  
 Ser Pro Phe Ala Arg Thr Gly Glu Gly Leu Asp Ile Arg Gly Ser Gln  
 180 185 190  
 Gly Phe Pro Trp Asp Ile Leu Phe Pro Ala Asp Pro Pro Phe Ser Pro  
 195 200 205  
 Gln Ser Cys Arg Pro Gln  
 210

<210> 16  
 <211> 214  
 <212> PRT  
 <213> Hepatitis Delta Virus

<400> 16  
 Met Ser Arg Ser Glu Arg Arg Lys Asp Arg Gly Gly Arg Glu Asp Ile  
 1 5 10 15  
 Leu Glu Gln Trp Val Ser Gly Arg Lys Lys Leu Glu Glu Leu Glu Arg  
 20 25 30  
 Asp Leu Arg Lys Leu Lys Lys Lys Ile Lys Lys Leu Glu Glu Asp Asn  
 35 40 45  
 Pro Trp Leu Gly Asn Ile Lys Gly Ile Ile Gly Lys Lys Asp Lys Asp  
 50 55 60  
 Gly Glu Gly Ala Pro Pro Ala Lys Lys Leu Arg Met Asp Gln Met Glu  
 65 70 75 80  
 Ile Asp Ala Gly Pro Arg Lys Arg Pro Leu Arg Gly Gly Phe Thr Asp  
 85 90 95  
 Lys Glu Arg Gln Asp His Arg Arg Arg Lys Ala Leu Glu Asn Lys Arg  
 100 105 110  
 Lys Gln Leu Ser Ser Gly Gly Lys Ser Leu Ser Arg Glu Glu Glu Glu  
 115 120 125



Glu Leu Lys Arg Leu Thr Glu Glu Asp Glu Lys Arg Glu Arg Arg Ile  
 130 135 140  
 Ala Gly Pro Ser Val Gly Gly Val Asn Pro Leu Glu Gly Gly Ser Arg  
 145 150 155 160  
 Gly Ala Pro Gly Gly Gly Pro Val Pro Ser Met Gln Gly Val Pro Glu  
 165 170 175  
 Ser Pro Phe Ala Arg Thr Gly Glu Gly Leu Asp Ile Arg Gly Ser Gln  
 180 185 190  
 Gly Phe Pro Trp Asp Ile Leu Phe Pro Ala Asp Pro Pro Phe Ser Pro  
 195 200 205  
 Gln Ser Cys Arg Pro Gln  
 210

<210> 17  
 <211> 214  
 <212> PRT  
 <213> Hepatitis Delta Virus

<400> 17  
 Met Ser Arg Ser Glu Ser Arg Lys Asn Arg Gly Gly Arg Glu Glu Ile  
 1 5 10 15  
 Leu Glu Gln Trp Val Ala Gly Arg Lys Lys Leu Glu Glu Leu Glu Arg  
 20 25 30  
 Asp Leu Arg Lys Thr Lys Lys Lys Leu Lys Lys Ile Glu Asp Glu Asn  
 35 40 45  
  
 Pro Trp Leu Gly Asn Ile Lys Gly Ile Leu Gly Lys Lys Asp Lys Asp  
 50 55 60  
 Gly Glu Gly Ala Pro Pro Ala Lys Arg Ala Arg Thr Asp Gln Met Glu  
 65 70 75 80  
 Val Asp Ser Gly Pro Arg Lys Arg Pro Leu Arg Gly Gly Phe Thr Asp  
 85 90 95  
 Lys Glu Arg Gln Asp His Arg Arg Arg Lys Ala Leu Glu Asn Lys Lys  
 100 105 110  
 Lys Gln Leu Ser Ala Gly Gly Lys Asn Leu Ser Lys Glu Glu Glu Glu  
 115 120 125  
 Glu Leu Arg Arg Leu Thr Glu Glu Asp Glu Arg Arg Glu Arg Arg Val  
 130 135 140  
 Ala Gly Pro Pro Val Gly Gly Val Asn Pro Leu Glu Gly Gly Ser Arg  
 145 150 155 160  
 Gly Ala Pro Gly Gly Gly Pro Val Pro Ser Leu Gln Gly Val Pro Glu  
 165 170 175  
 Ser Pro Phe Ser Arg Thr Gly Glu Gly Leu Asp Ile Arg Gly Asn Gln  
 180 185 190  
 Gly Phe Pro Trp Asp Ile Leu Phe Pro Ala Asp Pro Pro Phe Ser Pro  
 195 200 205  
 Gln Ser Cys Arg Pro Gln  
 210

<210> 18  
 <211> 37  
 <212> PRT  
 <213> Artificial Sequence

<220>  
 <223> Synthetic peptide from the multimer-forming domain of HDAG

&lt;400&gt; 18

```

Lys Lys Leu Glu Glu Leu Glu Arg Asp Leu Arg Lys Leu Lys Lys Lys
 1           5           10           15
Ile Lys Lys Leu Glu Glu Asp Asn Pro Trp Leu Gly Asn Ile Lys Gly
      20           25           30
Ile Ile Gly Lys Tyr
      35

```

&lt;210&gt; 19

&lt;211&gt; 38

&lt;212&gt; PRT

&lt;213&gt; Hepatitis Delta Virus

&lt;220&gt;

&lt;223&gt; Synthetic peptide from the multimer-forming domain of HDAG

&lt;400&gt; 19

```

Gly Arg Glu Asp Ile Leu Glu Gln Trp Val Ser Gly Arg Lys Lys Leu
 1           5           10           15
Glu Glu Leu Glu Arg Asp Leu Arg Lys Leu Lys Lys Lys Ile Lys Lys
      20           25           30

```

```

Leu Glu Glu Asp Asn Pro
      35

```

&lt;210&gt; 20

&lt;211&gt; 50

&lt;212&gt; PRT

&lt;213&gt; Artificial Sequence

&lt;220&gt;

&lt;223&gt; Synthetic peptide from the multimer-forming domain of HDAG

&lt;400&gt; 20

```

Gly Arg Glu Asp Ile Leu Glu Gln Trp Val Ser Gly Arg Lys Lys Leu
 1           5           10           15
Glu Glu Leu Glu Arg Asp Leu Arg Lys Leu Lys Lys Lys Ile Lys Lys
      20           25           30

```

```

Leu Glu Glu Asp Asn Pro Trp Leu Gly Asn Ile Lys Gly Ile Ile Gly
      35           40           45
Lys Tyr
      50

```

&lt;210&gt; 21

&lt;211&gt; 598

&lt;212&gt; DNA

&lt;213&gt; Artificial Sequence

&lt;220&gt;

&lt;223&gt; Synthetic HDAG gene for optimized expression in E. Coli

&lt;221&gt; CDS

&lt;222&gt; (1)...(585)

&lt;400&gt; 21

atg agc cgt agc gaa cgt cgt aaa gat cgt ggc ggc cgt gaa gat att	48
Met Ser Arg Ser Glu Arg Arg Lys Asp Arg Gly Gly Arg Glu Asp Ile	
1 5 10 15	
ctg gaa cag tgg gtg agc ggc cgt aag aag tta gag gaa ttg gaa cgt	96
Leu Glu Gln Trp Val Ser Gly Arg Lys Lys Leu Glu Glu Leu Glu Arg	
20 25 30	
gat ctg cgt aaa ctg aaa aag aag att aag aaa ctg gaa gaa gat aac	144
Asp Leu Arg Lys Leu Lys Lys Lys Ile Lys Lys Leu Glu Glu Asp Asn	
35 40 45	
ccg tgg ttg ggt aat att aaa ggc att att ggc aag aaa gat aaa gat	192
Pro Trp Leu Gly Asn Ile Lys Gly Ile Ile Gly Lys Lys Asp Lys Asp	
50 55 60	
ggc gaa ggc gcg ccg ccg gcg aag aaa ctg cgt atg gat cag atg gaa	240
Gly Glu Gly Ala Pro Pro Ala Lys Lys Leu Arg Met Asp Gln Met Glu	
65 70 75 80	
att gat gcg ggc ccg cgt aaa cgt ccg ctg cgt ggc ggc ttt acc gat	288
Ile Asp Ala Gly Pro Arg Lys Arg Pro Leu Arg Gly Gly Phe Thr Asp	
85 90 95	
aag gaa cgt cag gac cat cgt cgt cgt aaa gcg ctg gaa aac aaa cgt	336
Lys Glu Arg Gln Asp His Arg Arg Arg Lys Ala Leu Glu Asn Lys Arg	
100 105 110	
aaa cag ctg agc agc ggc ggc aaa tct ctg agc cgt gaa gaa gaa gaa	384
Lys Gln Leu Ser Ser Gly Gly Lys Ser Leu Ser Arg Glu Glu Glu Glu	
115 120 125	
gaa ctg aaa cgt ctg acc gaa gaa gat gaa aaa cgt gaa cgt cgt att	432
Glu Leu Lys Arg Leu Thr Glu Glu Asp Glu Lys Arg Glu Arg Arg Ile	
130 135 140	
gca ggt cca tct gtt ggt ggt gtg aac ccg ctg gaa ggc ggc agc cgt	480
Ala Gly Pro Ser Val Gly Gly Val Asn Pro Leu Glu Gly Gly Ser Arg	
145 150 155 160	
ggt gca ccg ggc ggt ggc ttt gtg ccg tct atg caa ggt gtt cca gaa	528
Gly Ala Pro Gly Gly Gly Phe Val Pro Ser Met Gln Gly Val Pro Glu	
165 170 175	
agc ccg ttt gcg cgt acc ggc gaa ggc ctg gat att cgt ggc agc cag	576
Ser Pro Phe Ala Arg Thr Gly Glu Gly Leu Asp Ile Arg Gly Ser Gln	
180 185 190	
ggc ttt ccg taaaccatgg cgc	598
Gly Phe Pro	
195	

&lt;210&gt; 22

&lt;211&gt; 195

&lt;212&gt; PRT

&lt;213&gt; Artificial Sequence

&lt;220&gt;

<223> Amino acid sequence encoded by synthetic gene for  
optimized HDAG expression in E. Coli

&lt;400&gt; 22

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Met Ser Arg Ser Glu Arg Arg Lys Asp Arg Gly Gly Arg Glu Asp Ile
 1           5           10           15
Leu Glu Gln Trp Val Ser Gly Arg Lys Lys Leu Glu Glu Leu Glu Arg
           20           25           30
Asp Leu Arg Lys Leu Lys Lys Lys Ile Lys Lys Leu Glu Glu Asp Asn
           35           40           45
Pro Trp Leu Gly Asn Ile Lys Gly Ile Ile Gly Lys Lys Asp Lys Asp
           50           55           60
Gly Glu Gly Ala Pro Pro Ala Lys Lys Leu Arg Met Asp Gln Met Glu
65           70           75           80
Ile Asp Ala Gly Pro Arg Lys Arg Pro Leu Arg Gly Gly Phe Thr Asp
           85           90           95
Lys Glu Arg Gln Asp His Arg Arg Arg Lys Ala Leu Glu Asn Lys Arg
           100          105          110
Lys Gln Leu Ser Ser Gly Gly Lys Ser Leu Ser Arg Glu Glu Glu Glu
           115          120          125
Glu Leu Lys Arg Leu Thr Glu Glu Asp Glu Lys Arg Glu Arg Arg Ile
           130          135          140
Ala Gly Pro Ser Val Gly Gly Val Asn Pro Leu Glu Gly Gly Ser Arg
145           150           155           160
Gly Ala Pro Gly Gly Gly Phe Val Pro Ser Met Gln Gly Val Pro Glu
           165           170           175
Ser Pro Phe Ala Arg Thr Gly Glu Gly Leu Asp Ile Arg Gly Ser Gln
           180           185           190
Gly Phe Pro

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&lt;210&gt; 23

&lt;211&gt; 598

&lt;212&gt; DNA

&lt;213&gt; Hepatitis Delta Virus

&lt;220&gt;

&lt;221&gt; CDS

&lt;222&gt; (1)...(598)

&lt;400&gt; 23

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atg agc cgg tcc gaa aga agg aaa gac cgc ggg ggg agg gaa gac atc      48
Met Ser Arg Ser Glu Arg Arg Lys Asp Arg Gly Gly Arg Glu Asp Ile
 1           5           10           15

ctc gag cag tgg gtg agc gga aga aag aag tta gag gaa ctc gag aga      96
Leu Glu Gln Trp Val Ser Gly Arg Lys Lys Leu Glu Glu Leu Glu Arg
           20           25           30

gac ctc cgg aag tta aag aag aaa atc aag aaa cta gag gaa gac aat      144
Asp Leu Arg Lys Leu Lys Lys Lys Ile Lys Lys Leu Glu Glu Asp Asn
           35           40           45

ccc tgg ctg gga aac atc aaa gga ata atc gga aag aag gat aag gat      192
Pro Trp Leu Gly Asn Ile Lys Gly Ile Ile Gly Lys Lys Asp Lys Asp
           50           55           60

```

gga gag ggg gca ccc ccg gcg aag aag ctc cgg atg gac cag atg gag 240  
 Gly Glu Gly Ala Pro Pro Ala Lys Lys Leu Arg Met Asp Gln Met Glu  
 65 70 75 80

ata gac gcc gga cct agg aag agg cct ctc agg gga gga ttc acc gac 288  
 Ile Asp Ala Gly Pro Arg Lys Arg Pro Leu Arg Gly Gly Phe Thr Asp  
 85 90 95

aag gag agg cag gat cac cga cga agg aag gcc ctc gag aac aag agg 336  
 Lys Glu Arg Gln Asp His Arg Arg Arg Lys Ala Leu Glu Asn Lys Arg  
 100 105 110

aag cag cta tcg tcg ggg gga aag agc ctc agc agg gag gag gaa gag 384  
 Lys Gln Leu Ser Ser Gly Gly Lys Ser Leu Ser Arg Glu Glu Glu Glu  
 115 120 125

gaa ctt aag agg ttg acc gag gaa gac gag aaa agg gaa aga aga ata 432  
 Glu Leu Lys Arg Leu Thr Glu Glu Asp Glu Lys Arg Glu Arg Arg Ile  
 130 135 140

gcc gcc ccg tcg gtt ggg ggt gtg aac ccc ctc gaa ggt gga tcg agg 480  
 Ala Gly Pro Ser Val Gly Gly Val Asn Pro Leu Glu Gly Gly Ser Arg  
 145 150 155 160

gga gcg ccc ggg gcc gcc ttc gtc ccc agc atg caa gga gtc ccg gag 528  
 Gly Ala Pro Gly Gly Gly Phe Val Pro Ser Met Gln Gly Val Pro Glu  
 165 170 175

tcc ccc ttc gct cgg acc ggg gag gga ctg gac ata agg gga agc cag 576  
 Ser Pro Phe Ala Arg Thr Gly Glu Gly Leu Asp Ile Arg Gly Ser Gln  
 180 185 190

gga ttc cca tgg gat ata ctc t 598  
 Gly Phe Pro Trp Asp Ile Leu  
 195

<210> 24

<211> 199

<212> PRT

<213> Hepatitis Delta Virus

<400> 24

Met Ser Arg Ser Glu Arg Arg Lys Asp Arg Gly Gly Arg Glu Asp Ile  
 1 5 10 15  
 Leu Glu Gln Trp Val Ser Gly Arg Lys Lys Leu Glu Glu Leu Glu Arg  
 20 25 30  
 Asp Leu Arg Lys Leu Lys Lys Lys Ile Lys Lys Leu Glu Glu Asp Asn  
 35 40 45  
 Pro Trp Leu Gly Asn Ile Lys Gly Ile Ile Gly Lys Lys Asp Lys Asp  
 50 55 60  
 Gly Glu Gly Ala Pro Pro Ala Lys Lys Leu Arg Met Asp Gln Met Glu  
 65 70 75 80  
 Ile Asp Ala Gly Pro Arg Lys Arg Pro Leu Arg Gly Gly Phe Thr Asp  
 85 90 95  
 Lys Glu Arg Gln Asp His Arg Arg Arg Lys Ala Leu Glu Asn Lys Arg  
 100 105 110

Lys Gln Leu Ser Ser Gly Gly Lys Ser Leu Ser Arg Glu Glu Glu Glu  
           115                  120          125  
 Glu Leu Lys Arg Leu Thr Glu Asp Glu Lys Arg Glu Arg Arg Ile  
       130                  135          140  
 Ala Gly Pro Ser Val Gly Gly Val Asn Pro Leu Glu Gly Gly Ser Arg  
 145                  150          155          160  
 Gly Ala Pro Gly Gly Gly Phe Val Pro Ser Met Gln Gly Val Pro Glu  
                   165          170          175  
 Ser Pro Phe Ala Arg Thr Gly Glu Gly Leu Asp Ile Arg Gly Ser Gln  
           180                  185          190  
 Gly Phe Pro Trp Asp Ile Leu  
           195

<210> 25  
 <211> 195  
 <212> PRT  
 <213> Hepatitis Delta Virus

<400> 25  
 Met Ser Arg Ser Glu Arg Arg Lys Asp Arg Gly Gly Arg Glu Asp Ile  
   1                  5          10          15  
 Leu Glu Gln Trp Val Ser Gly Arg Lys Lys Leu Glu Glu Leu Glu Arg  
           20                  25          30  
 Asp Leu Arg Lys Leu Lys Lys Lys Ile Lys Lys Leu Glu Glu Asp Asn  
       35                  40          45  
 Pro Trp Leu Gly Asn Ile Lys Gly Ile Ile Gly Lys Lys Asp Lys Asp  
   50                  55          60  
 Gly Glu Gly Ala Pro Pro Ala Lys Lys Leu Arg Met Asp Gln Met Glu  
 65                  70          75          80  
 Ile Asp Ala Gly Pro Arg Lys Arg Pro Leu Arg Gly Gly Phe Thr Asp  
           85                  90          95  
 Lys Glu Arg Gln Asp His Arg Arg Arg Lys Ala Leu Glu Asn Lys Arg  
           100                  105          110  
 Lys Gln Leu Ser Ser Gly Gly Lys Ser Leu Ser Arg Glu Glu Glu Glu  
       115                  120          125  
 Glu Leu Lys Arg Leu Thr Glu Asp Glu Lys Arg Glu Arg Arg Ile  
       130                  135          140  
 Ala Gly Pro Ser Val Gly Gly Val Asn Pro Leu Glu Gly Gly Ser Arg  
 145                  150          155          160  
 Gly Ala Pro Gly Gly Gly Phe Val Pro Ser Met Gln Gly Val Pro Glu  
                   165          170          175  
 Ser Pro Phe Ala Arg Thr Gly Glu Gly Leu Asp Ile Arg Gly Ser Gln  
           180                  185          190  
 Gly Phe Pro  
           195

<210> 26  
 <211> 93  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> PCR Primer

<400> 26  
gggcatatga gccgtagcga acgtcgtaaa gatcgtggcg gccgtgaaga tattctggaa 60  
cagtgggtga gcggccgtaa gaagttagag gaa 93

<210> 27  
<211> 95  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> PCR Primer

<400> 27  
atattaccca accacgggtt atcttcttcc agtttcttaa tcttcttttt cagtttacgc 60  
agatcacgtt ccaattcttc taacttctta cggcc 95

<210> 28  
<211> 94  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> PCR Primer

<400> 28  
taaccgctgg ttgggtaata ttaaaggcat tattggcaag aaagataaag atggcgaagg 60  
cgcgccgccg gcgaagaaac tgcgtatgga tcag 94

<210> 29  
<211> 94  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> PCR Primer

<400> 29  
gatggtcctg acgttcctta tcggtaaagc cgccacgcag cggacgttta cgcgggccccg 60  
catcaatttc catctgatcc atacgcagtt tctt 94

<210> 30  
<211> 93  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> PCR Primer

<400> 30  
ataaggaacg tcaggaccat cgtcgtcgta aagcgttgga aaacaaacgt aaacagctga 60  
gcagcggcg caaatctctg agccgtgaag aag 93

<210> 31  
<211> 89  
<212> DNA  
<213> Artificial Sequence

&lt;220&gt;

&lt;223&gt; PCR Primer

&lt;400&gt; 31

caacagatgg acctgcaata cgacgttcac gtttttcac ttcttcggtc agacgtttca 60  
gttcttcttc ttcttcacgg ctacagagat 89

&lt;210&gt; 32

&lt;211&gt; 101

&lt;212&gt; DNA

&lt;213&gt; Artificial Sequence

&lt;220&gt;

&lt;223&gt; PCR Primer

&lt;400&gt; 32

tattgcaggt ccattctgttg gtgggtgtgaa cccgctggaa ggcggcagcc gtggcgcgcc 60  
ggcgcgcgcc ttgtgcccgt ctatgcaagg tggtccagaa a 101

&lt;210&gt; 33

&lt;211&gt; 90

&lt;212&gt; DNA

&lt;213&gt; Artificial Sequence

&lt;220&gt;

&lt;223&gt; PCR Primer

&lt;400&gt; 33

gcgccatggt ttacggaaag ccttggtgc cacgaatata caggccttcg ccggtacgcg 60  
caaacgggct ttctggaaca cttgcatag 90

&lt;210&gt; 34

&lt;211&gt; 20

&lt;212&gt; DNA

&lt;213&gt; Artificial Sequence

&lt;220&gt;

&lt;223&gt; PCR Primer

&lt;400&gt; 34

gggcatatga gccgtagcga 20

&lt;210&gt; 35

&lt;211&gt; 20

&lt;212&gt; DNA

&lt;213&gt; Artificial Sequence

&lt;220&gt;

&lt;223&gt; PCR Primer

&lt;400&gt; 35

gcgccatggt ttacggaaag 20